NewCAL

Design Review Committee

October 12, 2022

Agenda

- Building Structure
- HVAC Selection
- Plan Updates

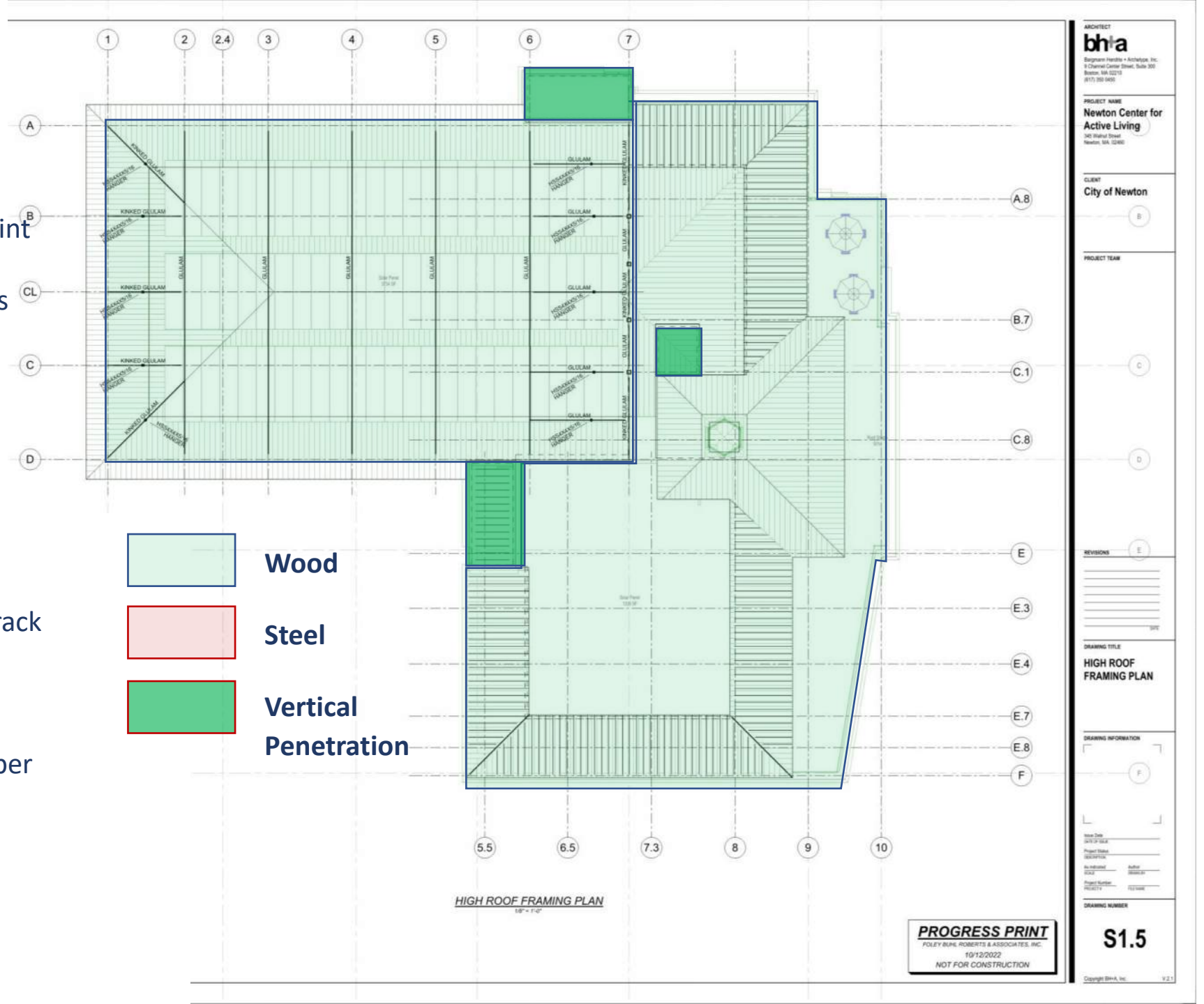
All Wood Structure
Gym and NewCAL

Pro:

- Least Carbon Building Footprint
- Faster time frame
- Lighter structure requires less foundation loading and less concrete used
- Exposed wood beam/trusses could be a design feature
- Better Thermal Performance

Con:

- Shorter Span capability
- Complication with Walking Track Support
- Expensive Glu-lam Beams for column free span
- Larger column sizes and Deeper Beams/Trusses generally
- Structure is less stiff



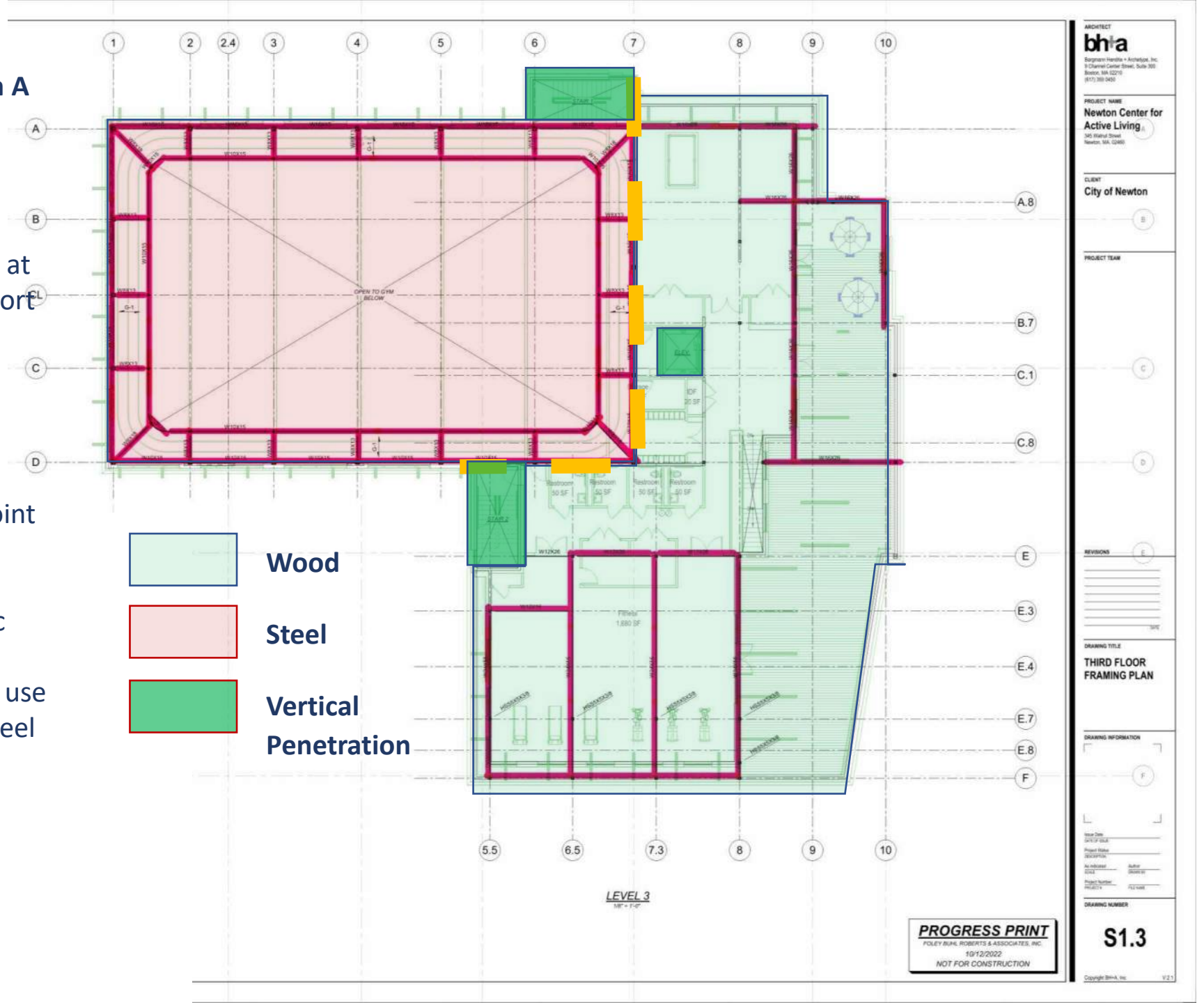
Mixed Steel and Wood - Option A
Gym - Steel Structure
NewCAL - Wood

Pro:

- Long Span Capability of Steel at Gym and Walking Track Support
- Straightforward Structural system @ Gym
- More Stiff framing at Gym

Con:

- Complication of Expansion Joint between Steel and Wood Structure
- Trade Complications in public bidding environment
- Increased concrete and steel use with Composite Deck with Steel Structure



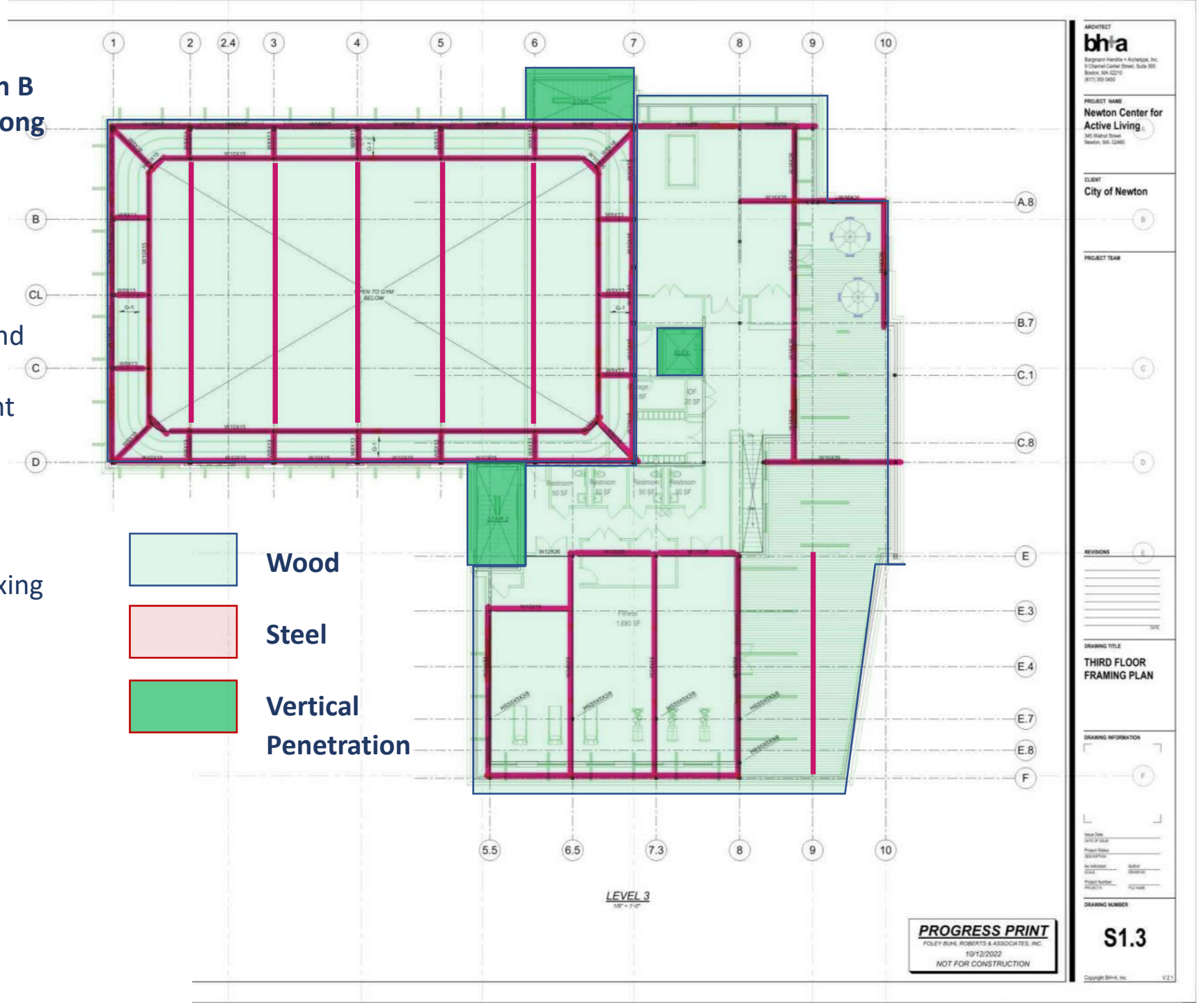
Hybrid Steel and Wood - Option B
Wood Structure with Steel for Long Span Spaces only

Pro:

- Steel only where needed for Long Span
- No added Composite Deck and Concrete
- Minimize on Carbon Footprint

Con:

- Complication with Trades mixing Steel Structure within Wood Frame
- C



HVAC Systems

System Descriptions

Air-source VRF

- Air cooled VRF Heat pumps (outdoor)
- Fan coil units (refrigerant)
- BC Controller (refrigerant distribution box)
- Copper refrigerant piping
- All system controls by VRF manufacturer
- Single system provides simultaneous heating and cooling to different zones
- System operates to -13°F outdoor air temp. No supplemental heat required

Air-Water Heat Pump/Chiller

- Air source water chillers (outdoor)
  - 2 systems, 1 for heating, 1 for cooling
- Fan coil units (hydronic, 4-pipe)
- 4-pipe system (hot and chilled water) Steel or copper pipe
- 3rd party controls to integrate all system components (heat pumps/chillers and fan coil units)
- System operates down to 0°F outdoor air temp. Supplemental heat required (electric boiler)

Relative First Costs

VRF Heat Pump (Air Source)

Lowest

- Less expensive equipment
- No pumps
- 2-pipe system (1 set pipes to do simultaneous heating or cooling)
- Smaller, flexible copper piping with minimal joints
- Simpler pipe insulation
- Integral/packaged control system

Air-Source Heat Pump Chiller

Higher

- More expensive equipment
- Requires pumps and control valves
- Requires multiple/redundant chillers to provide simultaneous heating and cooling.
- Requires 4-pipe distribution (2 sets of piping to do simultaneous heating and cooling)
- Piping is larger with many more joints.
- Insulation is thicker and more expensive
- Requires a supplemental electric boiler for low outdoor temperature operation
- Requires separate control system

VRF Heat Pump with Geothermal

Highest

- VRF water-cooled equipment slightly more expensive than air-cooled VRF system
- The piping, insulation and controls are the same as the base VRF system
- The main extra cost is the wells and pumps

Big Picture Energy Comparison

- Many variables and lack of manufacturer data make a definitive comparison of the efficiencies is difficult without detailed energy design and energy analysis
- Both types of systems use the same technology (refrigerant compressors) and extract heat from or reject heat to the same temperature source (outdoor air), and therefore *should have similar efficiencies*
  - VRF (air cooled) heating and cooling efficiencies vary by outdoor air temperature
  - Air-water heat pump heating and cooling efficiencies vary by outdoor air temperatures AND supply water temperature
  - Air-water heat pumps require pumps which cost more energy for the system, which is not captured in the equipment efficiency ratings
  - The VRF system can "move" heat within the system from zone that are in cooling to zones that need heating. AWHP can't.
- To get a definitive energy comparison a detailed energy model would be required. And the design for both systems would need to go further than schematic design level.
  - Equipment selections (VRF units, chillers, pumps, etc.)
  - System operating conditions (chiller heat pump system)
- One certainty - VRF with Geothermal is the premium efficiency system.
  - Heat pump extracts heat from 50°F earth instead of 6°F air

VRF (Air) COP = 3.46 @ AHRI conditions (47°F)

Chiller Heat Pump (Air) COP = 2.6 @ 25°F ambient @ 105°F HWS = 1.8 @ 25°F ambient @ 140°F HWS

VRF (Geo) COP = 5.46 @ AHRI conditions (47°F)

Maintenance & Installation Considerations

Air Source VRF

- Maintenance
  - FCU Filter changes
- Installation
  - Insulation more forgiving
  - Refrigerant leaks detected at start-up
  - Smaller flexible pipe easier to route

Heat Pump Water Chiller

- Maintenance
  - FCU Filter changes
  - Glycol / water treatment
  - Valve operator failure
  - Pumps - oiling / failures
- Installation
  - Insulation needs to be done well to prevent condensation
  - Potential water leaks over time
  - Need space for electric boiler, pumps & tanks

Similarities

- Noise
- Expected life

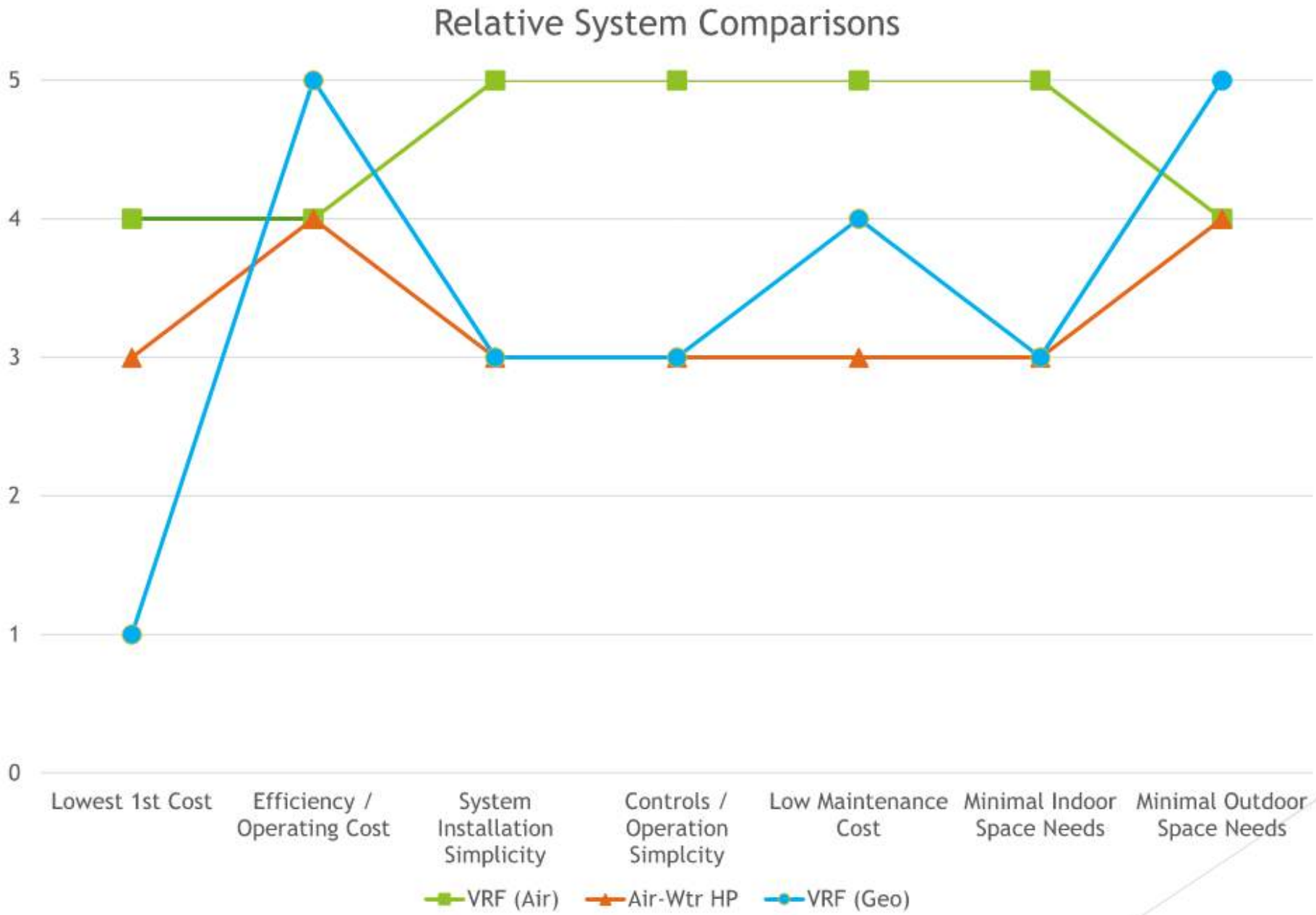
Geothermal Considerations

Wells

- Approx 20 – 600 foot closed loop wells needed (preliminary, depend on several factors)
- 40 foot spacing required
- Space is an issue

Cost

- $35/foot for borehole drill and pipe (ballpark)
- $35 x 600 ft = $21,000/well
- 20 wells = $420,000
- Numbers are order-of-magnitude only and not a firm estimate



Note: Vertical axis #s are to show relative difference, not any specific value. 0 is worst, 5 is best.

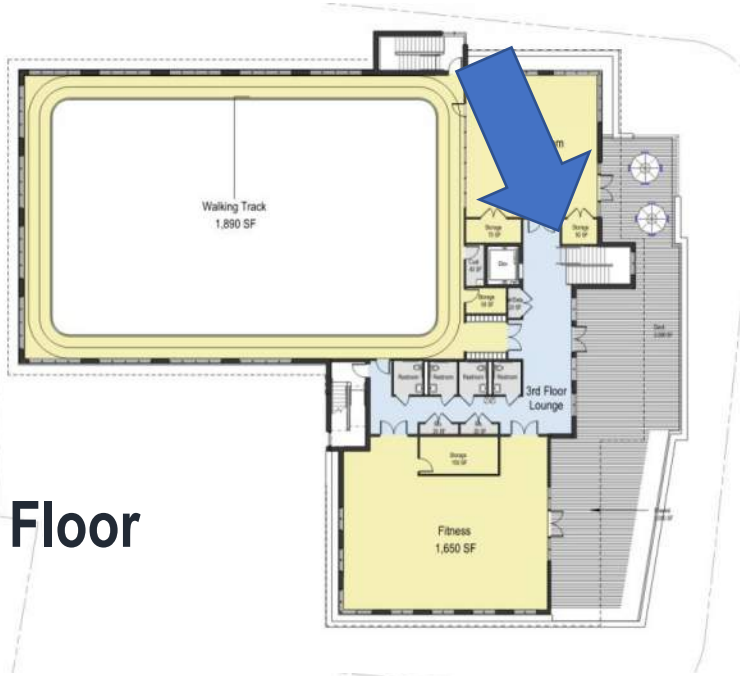
	1st Cost	Efficiency	Installation Complexity	Controls Simplicity	Relative Maintenance Cost	Indoor Mechanical Space Required
VRF (Air)	Lowest	Good	Simplest	Simplest	Low	Least (ceiling space for BC controller)
AWHP	Higher	Good	More Complicated	More Complicated	Higher	More (pumps, elec. boiler)
VRF (Geo)	Highest	Best	More Complicated	More Complicated	Higher	Most (heat pumps, pumps)

Plan Updates


Highland Avenue
Walnut Street
Walnut Place
Walnut Place
Washington
N
0'
15'
30'
60'

Site Plan

Previous Design – Sept. 2022



3rd Floor

2nd Floor

Lobby - Stair to Third Floor

Highland Avenue

Walnut Street

Walnut Place

FIRST FLOOR

Lobby - Stair to Second Floor only

Lounge - View towards Activity / Dining Room

Lounge - View towards Juice Bar

Highland Avenue

Walnut Street

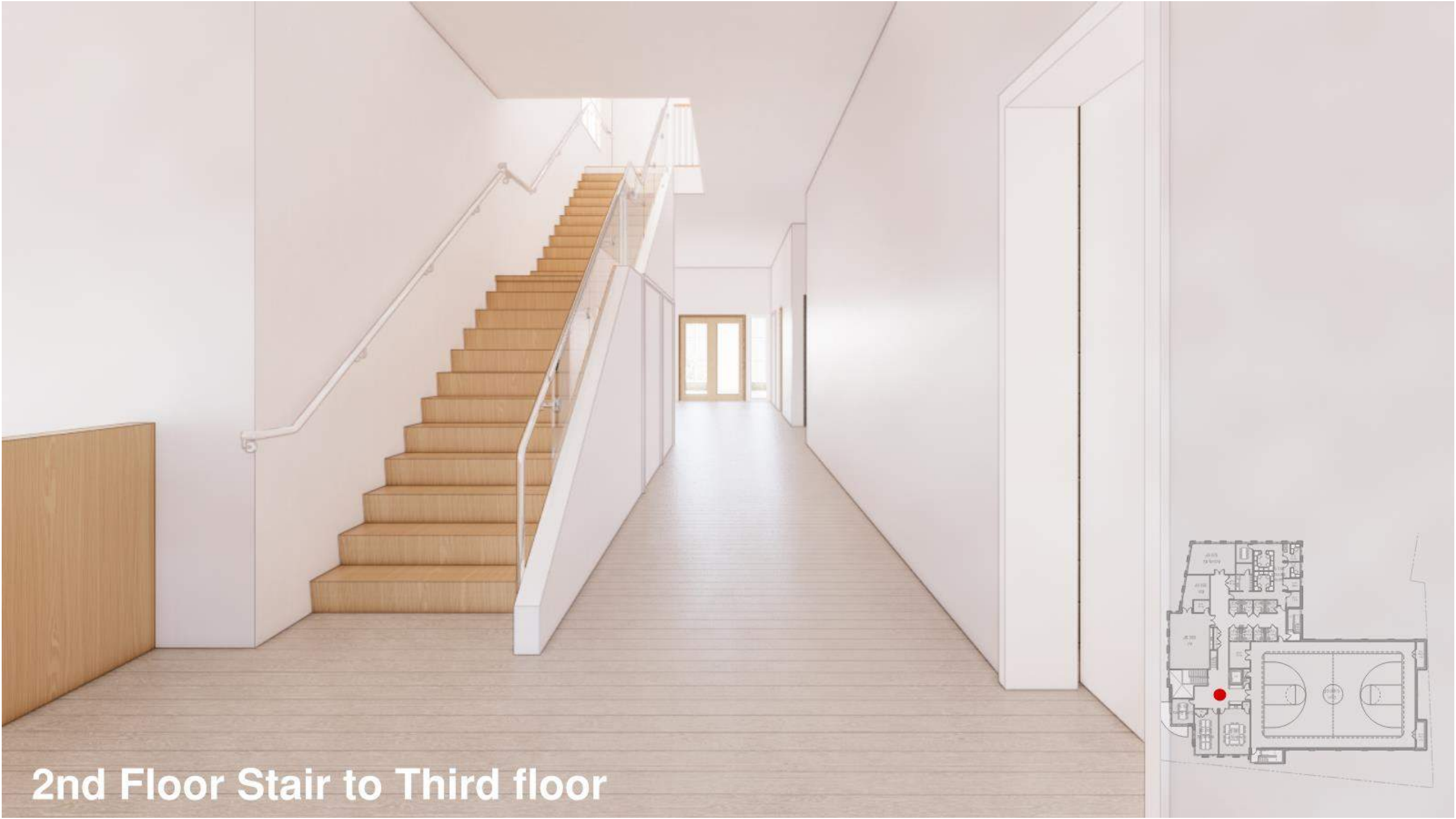
Walnut Place

SECOND FLOOR

N

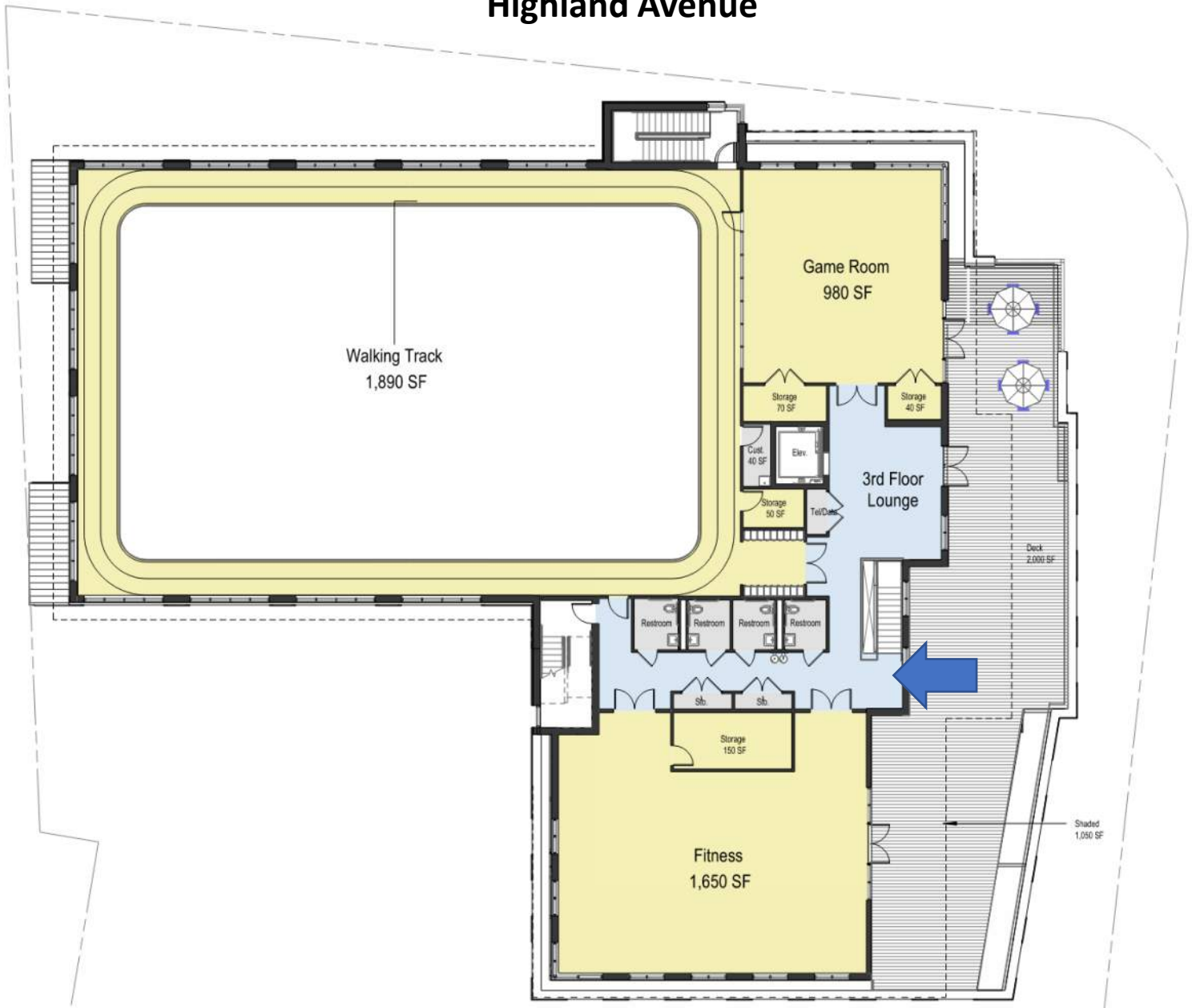
0' 8' 16' 32'

V.2.1



2nd Floor Stair to Third floor

Highland Avenue



Walnut Street

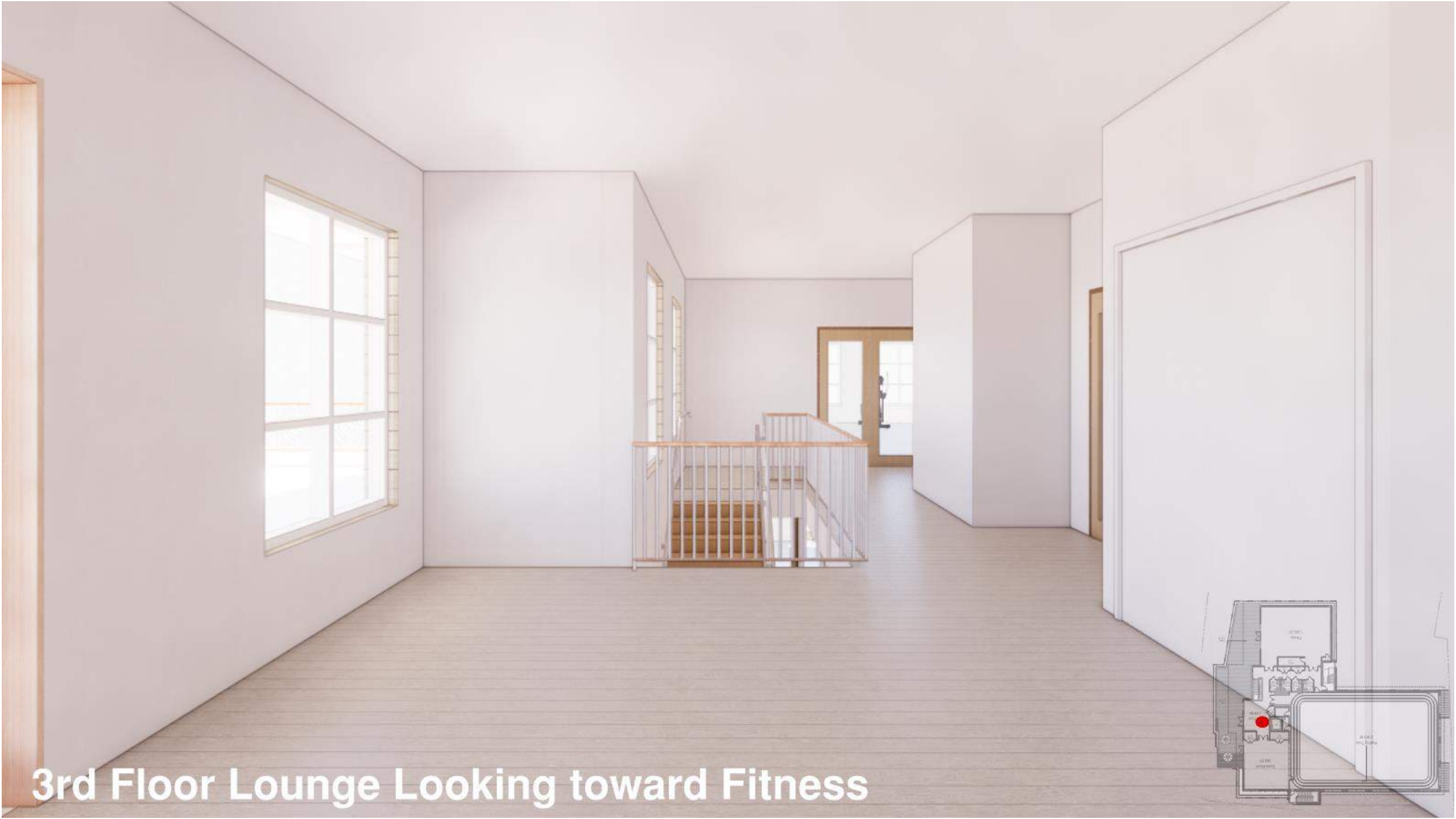
THIRD FLOOR

Walnut Place

N

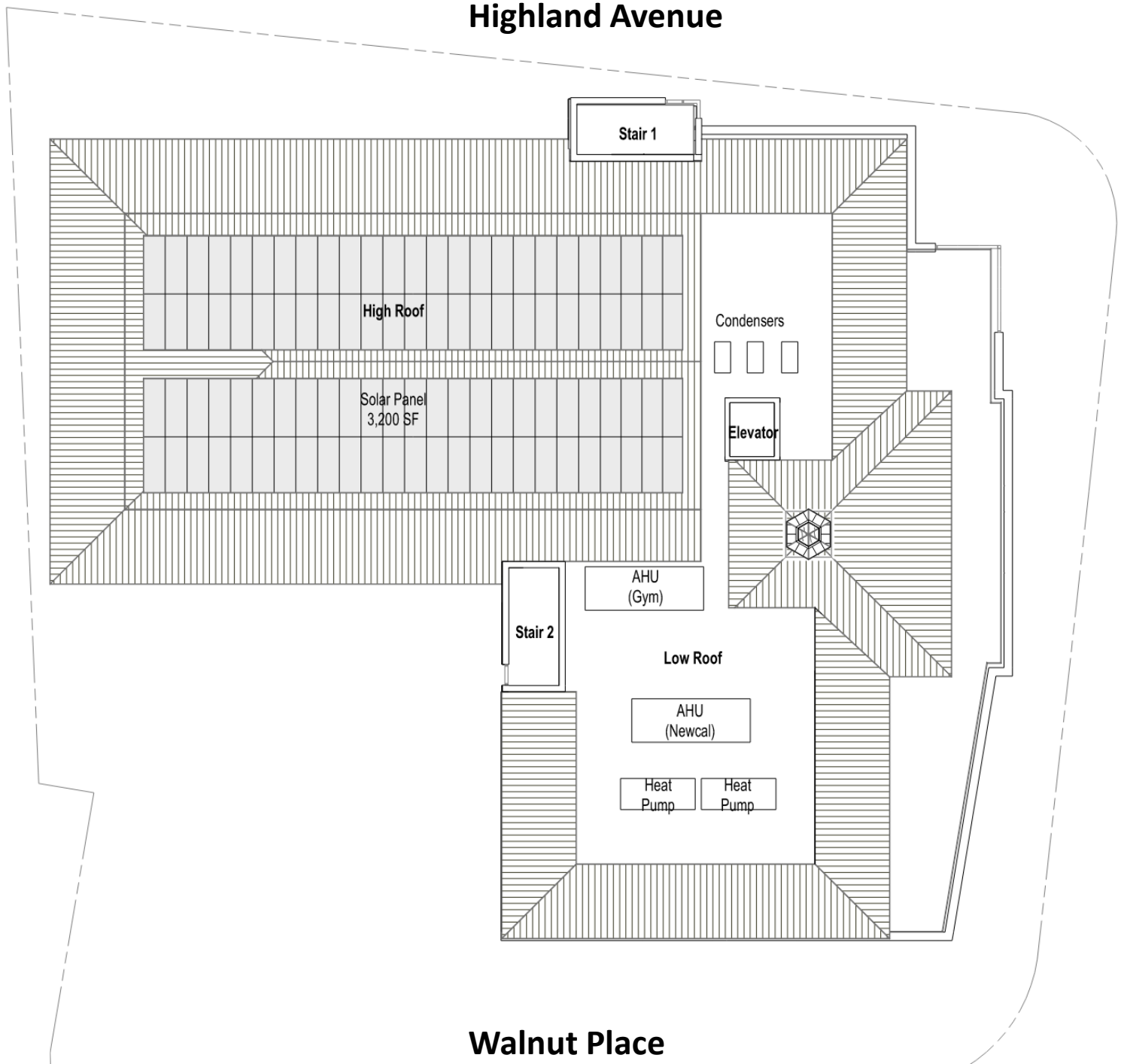
0' 8' 16' 32'

V.2.1



3rd Floor Lounge Looking toward Fitness

ROOF PLAN


Highland Avenue
Stair 1
High Roof
Solar Panel
3,200 SF
Condensers
Elevator
Walnut Street
AHU
(Gym)
Stair 2
Low Roof
AHU
(Newcal)
Heat
Pump
Heat
Pump
Walnut Place
N
0'
8'
16'
32'
V.2.1

Storage Impact To Exterior Facade

West Elevation

Walnut Street Elevation

Highland Avenue Elevation

Walnut Place Elevation

Walnut Street and Highland Avenue

Thank You